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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---------------------------|-------------|----------------------|---------------------|------------------|
| 10/517,090 | 08/30/2005 | Michail Tsatsanis | VOY-023US | 1123 |
| 26875 | 7590 | 12/13/2006 | EXAMINER | |
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| | | | | ART UNIT |
| | | | | PAPER NUMBER |
| | | | | 2611 |

DATE MAILED: 12/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

| | | | |
|-----------------|------------|--------------|------------------|
| Application No. | 10/517,090 | Applicant(s) | TSATSANIS ET AL. |
| Examiner | Sam K. Ahn | Art Unit | 2611 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on pre-admt, 08/30/05.
2a) This action is FINAL. 2b) This action is non-final.
3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-3,5-15,17-27,29-39 and 41-47 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) Claim(s) _____ is/are allowed.
6) Claim(s) 1-3,5-7,13-15,17-19,25-27,29-31,37-39,41 and 42 is/are rejected.
7) Claim(s) 8-12,20-24,32-36 and 43-47 is/are objected to.
8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.
10) The drawing(s) filed on 06 December 2004 is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)
2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 083005.

4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) Notice of Informal Patent Application
6) Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 5-12, 17-24, 29-36, 38, 39 and 45-47 are objected to because of the following informalities:

In claim 5, line 1, "and two" should be "and the two".

In claim 6, line 1, "wherein receiving" should be "wherein the receiving".

In claim 8, line 1, "wherein receiving" should be "wherein the receiving".

In claim 11, line 1, "wherein pre-whitening" should be "wherein the pre-whitening", line 4, "of interference" should be "of the interference".

In claim 17, line 1, "of claim 12" should be "of claim 13" wherein claim 17 is an apparatus claim and claim 12 is a method claim. Claim 13 is an apparatus, and from the claim diagram of claims 1-12, it appears that claim 17 should depend on claim 13. And in line 1, "receivers and" should be "receivers and the".

In claim 18, line 1, "wherein means" should be "wherein the means", line 2, "physical-layer signals across two" should be "the physical layer signals across the two".

In claim 23, line 5, "interference" should be "the interference".

In claim 29, line 2, "and two" should be "and the two".

In claim 30, line 2, "across two" should be "across the two".

In claim 31, line 2, "across two" should be "across the two".

In claim 32, line 2, "physical-layer signals across two" should be "physical layer signals across the two".

In claim 35, line 6, "of interference" should be "of the interference".

In claim 38, line 2, "minimize interference" should be "minimize the interference".

In claim 43, "MI O" should be "MIMO".

In claim 44, line 3, "MMO" and "MJMO" should both be "MIMO".

Claims 7,9,10,12,19,20-22,24,33,34,36,39 and 45-47 directly or indirectly depend on claim 5,17,29,38 or 44. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1,3,5-7,13,15,17-19,25,27,29-31,37,39,41 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polley et al. US 5,999,563 (Polley, cited in the IDS) in view of Kantschuk et al. US 7,046,751 B1 (Kantschuk).

Regarding claim 1, Polley teaches a method comprising: creating a communications line with two or more twisted copper pairs of wire in one or more binders (see Fig. 6b having twisted pairs A and B 140 in one binder of telephone subscriber cable); receiving from said two or more twisted pairs across two or more receivers physical layer signals (each of the twisted pairs A and B receiving and transmitting physical layer signals 185 in Fig.1e) that have been coordinated across two or more transmitters (wherein the modem in illustrated in Fig.14a

comprising transmitters and receivers communicating with modems on the other side of the twisted pairs A and B). And although Polley further teaches NEXT (near-end crosstalk interferences) cancellation, Polley does not explicitly teach exploiting a correlation between measured interference noise values across two or more of said receivers to reduce interference noise in the physical layer signals.

Kantschuk teaches in the same field of endeavor of twisted pairs of wire in a binder or shared cable (18 in Fig.1) coupling modem pools in both ends of the cable. Kantschuk further teaches exploiting a correlation between measured interference noise values (comparing among A-P disturber modems causing greatest NEXT interference, note col.8, lines 45-48, the measured NEXT interference values note col.7, lines 37-45) across two or more of receivers (receivers in modems of 12 or 10 in Fig.1) to reduce interference noise (applying probe filters to modems with NEXT disturber, hence reduces NEXT interference, note col.8, lines 35-48) in the signals across the twisted pairs. Hence, both Polley and Kantschuk teach modem pools transmitting and receiving signals and suffering from NEXT interference, wherein Polley teaches that the signals are physical layer signal. Kantschuk further teaches that dynamic allocation of NEXT cancellation filters in the modem pool environment adapts to environment conditions and the physical behavior of copper pairs (note col.2, lines 36-45), wherein one skilled in the art at the time the invention was made would recognize based on the teaching of Polley that the signals across the copper pairs are also

physical layer signals. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate the teaching of Kantschuk in the system of Polley of applying the NEXT cancellation filters to reduce NEXT interference in the modem pool for the purpose of reducing interference by adapting to environment conditions and the physical behavior of copper pairs (note col.2, lines 36-45).

Regarding claim 3, Polley further teaches wherein the interference noise includes crosstalk noise (NEXT: Near-end crosstalk noise, note col.41, line 45-59) from high-bitrate services (ADSL service supporting 6Mbps downstream, note col.2, lines 21-24) in the one or more binders (see Fig. 6b having twisted pairs A and B 140 in one binder of telephone subscriber cable).

Regarding claim 5, Polley further teaches wherein the two or more receivers and two or more transmitters (wherein the modem is illustrated in Fig.14a comprising transmitters and receivers communicating with modems on the other side of the twisted pairs A and B) utilize a Discrete Multi-Tone architecture having one or more frequency bins (DMT, note col.4, lines 42-44, wherein one skilled in the art at the time the invention was made would recognize that DMT schemes employ plurality of frequency bins or channels separated by different frequency bandwidths, which is well-known to one skilled in the art).

Regarding claim 6, Polley further teaches wherein the receiving physical-layer signals across two or more receivers (each of the twisted pairs A and B receiving and transmitting physical layer signals 185 in Fig.1e) is performed in a frequency domain (see Fig.13a wherein upstream and downstream channels or channels for transmitting and receiving are in frequency domain), independently for each frequency bin of the one or more frequency bins (wherein one skilled in the art at the time the invention was made would recognize that DMT scheme employs plurality of channels or frequency bins wherein each of the channels have its own data independent from its neighboring channels, which is well-known in the art).

Regarding claim 7, Polley further teaches wherein the receiving physical-layer signals across two or more transmitters (each of the twisted pairs A and B receiving and transmitting physical layer signals 185 in Fig.1e) is performed in a frequency domain (see Fig.13a wherein upstream and downstream channels or channels for transmitting and receiving are in frequency domain), independently for each frequency bin of the one or more frequency bins (wherein one skilled in the art at the time the invention was made would recognize that DMT scheme employs plurality of channels or frequency bins wherein each of the channels have its own data independent from its neighboring channels, which is well-known in the art).

Regarding claim 13, the claim is rejected as applied to claim 1 with similar scope.

Regarding claim 15, the claim is rejected as applied to claim 3 with similar scope.

Assuming that claim 17 depends on claim 13 (*note Claim objections above*), the claim is rejected as applied to claim 5 with similar scope.

Regarding claim 18, the claim is rejected as applied to claim 6 with similar scope.

Regarding claim 19, the claim is rejected as applied to claim 7 with similar scope.

Regarding claim 25, the claim is rejected as applied to claim 1 with similar scope.

Regarding claim 27, the claim is rejected as applied to claim 3 with similar scope.

Regarding claim 29, the claim is rejected as applied to claim 5 with similar scope.

Regarding claim 30, the claim is rejected as applied to claim 6 with similar scope.

Regarding claim 31, the claim is rejected as applied to claim 7 with similar scope.

Regarding claim 37, the claim is rejected as applied to claim 1 with similar scope.

Polley teaches two or more receivers or transmitters in modems of central office

1~N in Fig.14a wherein the other end of the twisted pair loop are modems in the customer cite as illustrated in Fig.12.

Regarding claim 39, the claim is rejected as applied to claim 3 with similar scope.

Regarding claim 41, the claim is rejected as applied to claim 5 with similar scope.

Regarding claim 42, the claim is rejected as applied to claim 6 with similar scope.

3. Claims 2,14,26 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polley et al. US 5,999,563 (Polley, cited in the IDS) in view of Kantschuk et al. US 7,046,751 B1 (Kantschuk) and Pakravan et al. US 6,259,391 B1 (Pakravan).

Regarding claim 2, Polley in view of Kantschuk teaches all subject matter claimed, as applied to claim 1. And although Polley in view of Kantschuk teach minimizing interference noise on the communication line, as previously explained (note Kantschuk, applying probe filters to modems with NEXT disturber, hence reduces NEXT interference, note col.8, lines 35-48), do not explicitly teach the interference noise is from external sources.

Pakravan teaches a system employing DMT techniques and further teaches that radio frequency interference (RFI) from AM radio stations (external sources, note col.1, lines 27-32) are interference affecting the DMT signals, hence, the RFI is suppressed or attenuated in the receiver (see RFI 26 in Fig.4 suppressed in the

receiver 20, note col.6, lines 30-38). Both Polley and Pakravan teach a receiver receiving DMT signals wherein the DMT signals are deteriorated by interferences wherein Pakravan further teaches that the interferences include external sources such as RFI. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate the teaching of Pakravan in the receiver of Polley by employing the receiver comprising the filters in Fig.4 for the purpose of suppressing interferences from AM radio stations (note col.1, line 27-32 and col.6, lines 30-38).

Regarding claim 14, the claim is rejected as applied to claim 2 with similar scope.

Regarding claim 26, the claim is rejected as applied to claim 2 with similar scope.

Regarding claim 38, the claim is rejected as applied to claim 2 with similar scope.

Allowable Subject Matter

4. Claims 8-12, 20-24, 32-36 and 45-47 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims, and overcome the claim objections.

5. Claims 43 and 44 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
6. The following is a statement of reasons for the indication of allowable subject matter:
present application discloses a system employing DMT scheme minimizing interferences in signals transmitted over twisted copper wire. Prior art teaches all subject matter claimed. However, prior art does not explicitly teach receiving the signals that has been multiplied with a transmitter MIMO processing matrix provided to an inverse fast Fourier transform, which then is coupled to a fast Fourier transform and to a receiver MIMO processing matrix during the receiving of the physical layer signals received over the twisted copper wire by receivers in the system.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ginis et al. US 2003/0086514 A1 teach a system employing DMT scheme and the transmitter in the system comprising MIMO pre-coder.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sam Ahn whose telephone number is (571) 272-3044. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2611

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Sam K. Ahn
Patent Examiner

12/04/06